EXTENSION CONFERENCE
NICOLLET HOTEL
Minneapolis, Minnesota
December 6 - 7, 1947

REGIONAL EXTENSION CONFERENCE

Minneapolis, Minnesota

December 6 and 7, 1947

The Regional Extension Conference met at 9:15 a.m., Saturday, December 6, 1947 in the North Shore Room, Nicollet Hotel.

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WEED CONTROL ORGANIZATION

South Dakota - Chas. J. Gilbert

The South Dakota weed law is brief. It gives broad responsibilities, duties and authority to a State Weed Board. These responsibilities and duties include formulating of a state weed program, the designation of the noxious weeds, the promotion of research and educational activities and the adoption of regulations to insure the effectiveness of the law and program. Preparation and carrying out of the weed control program is, therefore, quite completely vested in this Board, consisting of nine members, the personnel of which is:

President of the South Dakota Crop Improvement Association
Chairman of the Association of Soil Conservation District
Secretary of Agriculture Supervisors
President of the State Horticultural Society
Director of South Dakota Extension Service
Head of the South Dakota State College Agronomy Department
Commissioner of School and Public Lands
Member of the State Highway Commission
Chairman of the Association of County Commissioners

The Committee personnel is, therefore, changed only as the officials of these agencies concerned with weed control and eradication change. This method of membership qualification tends to promote continuity and stability.

The law provides further that counties which have a weed control organization as provided by the regulations may appropriate money for weed control purposes and above other legal statutory taxation limits to the amount of one mill levy on all assessed valuation. This provides for local interest, financial support and responsibility. Thirty-four counties have appropriated in excess of $136,000 for local weed control work in amounts ranging from $12,000 down to $500.

Four phases of work are included in the program:

1. Research - In 1947 research included trial plots in all areas of the state on different noxious weeds with different formulations and different strengths. Various dates of applications and period of weed growth were also included in these experimental areas. A number of other items of research were carried on at State College, one of which was engineering as to application, and equipment.

2. Education - The program as outlined by the State Weed Board stipulates that educational activities are to be carried on by and in cooperation with the Agricultural Extension Service. Preliminary reports show that 8,500 people attended 270 weed meetings and demonstrations

during 1947. Slides, bulletin material and specialist service were furnished. An equipment show was held and organizational assistance was given.

3. Enforcement - The only enforcement program since the activation of the law July 1, 1947 was the inspection and cleaning of transient combines and trucks at ports of entry. Approximately 5,500 units were inspected and cleaned, consisting of 3,700 combines and 1,800 other vehicles. These were cleaned with water pressure and air lines having high compression. One such inspection station cleaned and inspected 320 units one day. Other phenomenal records were noted. Operators of these machines frequently commented that the South Dakota inspection was most rigid and thorough. To these machines were then attached clearance tags showing they had been cleaned and that they were complying with the state law in preventing spread of noxious weed seeds.

4. Administration and Organization - The administration of the law and program was in the hands of the State Weed Board and the steps in organization are provided by regulation.

Each county is divided into community areas. These communities must each have an educational meeting once a year at which time a weed representative is elected. After the last educational meeting is held the weed representatives meet and elect a county weed board of three members. The county weed board is charged with the responsibility of preparing and carrying out the county weed program. Forty-five counties are now listed as having county weed committees and community organizations.

The communities are broken down into neighborhood units with neighborhood leaders. Every farm, farmer and piece of land thus becomes a part of the program.

The success of the program is based primarily on voluntary effort, organization and cooperative activity. Experience has shown that enforcement and regulation is reduced to a minimum when local effort, organization and cooperation is at a high level.

The South Dakota weed control program is just starting, but is definitely in high gear.

Iowa - E. P. Sylwester

The weed control program in Iowa is based on education. However, our last legislative session has amended our weed law to the extent that if it becomes necessary to enforce the provisions of the law it can very easily be done. If enforcement becomes necessary, the titled owner of the land bears the expense. The weed law provides for a county weed commissioner, for an enabling mileage levy for weed control work, for an enabling levy for roadside brush control work, and for purchase of county owned weed eradicating (spraying) equipment. The weed law enforcement in each individual county is up to the county weed commissioner, acting under the board of supervisors. The swing to county weed commissioners has been slow, due to absence of suitable personnel. Last year, counties operated under the county weed commissioner plan. Even in counties where active weed control programs are in action, enforcement has been necessary in only a few instances. This is because the entire program is based on education, with enforcement used as a last measure. Cooperation between the State Dept. Agriculture, the Extension Service, and the Experiment Station is excellent.

In an educational way, the specialist in the Extension Service devoted full time to helping counties organize better weed control activities. There were individual weed meetings held in 45 counties, consuming 76 days. There were 42 days spent in state and district time at which time at regional field days, most of our 99 counties secured additional help on weed control. In all, the specialist attended 183 meetings of all types, night schools, demonstrations, open county meetings, supervisory board meetings, etc. The total attendance at all meetings where weed control was discussed was 18,201. There were 77 individual farm visits to problem areas, 18 radio talks on weeds and 20 press articles on weed control. These latter are written up for newspaper use but are also reworked by our Publicity Department for use in county agent news releases and radio work. Five new leaflets on weed control were prepared, one cooperative bulletin with the State Department of Agriculture is in press, and two reprints in "Farm Science" were extensively used in meetings and correspondence to the extent of 40,000 copies of each reprint. There were 2,117 first-class letters written in response to inquiries concerning weed control. A kodachrome chemical weed control set of 150 slides was completed. Exhibits on weed control were sponsored at the State Fair, Dairy Cattle Congress and by means of the Extension "Caravan.

Never has interest in weed control been so high. Many hundreds of acres of oats, flax, and corn were sprayed for weed control this year. Our most effective teaching method has been the demonstration type, where for 30-45 minutes on field days, or at special meetings, we demonstrated our small portable inexpensive sprayer. Tractor attachment units are becoming extremely popular. In one county, there are now 50 such units, in another 200 where there wasn't one a year ago. There are several companies in Iowa making these units at the present time. However, the surface has barely been scratched. We believe that as soon as these inexpensive trailer or tractor units become plentiful, they will be standard equipment on every farm. In addition, we have record of at least 360 custom sprayer operators in Iowa now, where 2 years ago, we had less than 50. The growth of individual home units and custom spraying has been phenomenal. We have two airplane companies doing aerial spraying. Altogether about 10,000 acres of pasture and corn land was sprayed for weed control by these two companies. About 50,000 additional acres of corn were sprayed with ground equipment by commercial operators. No figures are available on individual amounts sprayed by individual farmers, but thousands of acres were treated. Practically all of our counties now have some type of spraying equipment for roadsides, much of it modern equipment which was purchased this past season. Others will have modern equipment shortly. We feel that our program is finally functioning very well, and that we now are really making progress and capitalizing on the many years of educational work which we have promoted.

Wisconsin enacted a new weed law in 1947 but the present law needs some revision. Numerous townships own spray equipment for local weed control. Such equipment is rather hard to schedule to serve all taxpayers. There are numerous private spray rigs which have proven more satisfactory than township spray rigs. Very little state funds are provided. The extension service has allowed workers to demonstrate control methods. 8,000 to 12,000 people attended the 8 Grassland field days, and smaller groups attended crops field days and other meetings.

North Dakota survey of 1947 weed control reported 17,000 acres of small grain treated with 2-4-D, 60,000 acres with Sinox - 72% was wheat, 20%

barley and 8% oats. The state weed law is rather ineffective and needs revision.

Minnesota Extension Service is cooperating with the statewide weed committee and other state weed control agencies.

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NEW CHEMICALS FOR WEED CONTROL

R. S. Dunham

Iso-propyl - N - Phenyl Carbamate has proved disappointing for the control of grass weeds and is not recommended.

Ammonium trichloroacetate is a selective for grass weeds, 100 to 160# per acre appears necessary. It shows some promise for use on quack grass. Certain Shell oils show promise for controlling grass weeds in flax. Ammate may be used to control poison ivy and may be applied dry on cut surfaces of stumps to prevent sprouting and hasten decay. 2-4-D esters can also be used for killing woody plants. There is a wide varietal difference in the tolerance of flax to 2-4-D. Successful spraying with 2-4-D for weed control in flax depends on the variety, on applications at the proper plant stage and on low rates.

Esters are most potent, amine salts are intermediate and sodium salts least injurious. 2-4-D treatment on flax may cause changes in drying quality of oil and oil content and may effect yield per acre if susceptible varieties are used. It may be safely used on all grasses not propagated by stolons for weed control except in the seedling stage.

R. G. Robinson reported 2-4-D pre-emergence spray assisted in controlling mustard and wild buckwheat early in the season. Four pounds per acre used with no injury to flax or oats. Acid dust - 2-4-D (non soluable) was unsuccessful - other 2-4-D sprays damaged alfalfa when 1# per acre was used. 2 to 4 # is satisfactory for flax and small grain. Sinox W controlled mustard and wild buckwheat and did not damage alfalfa. Flame cultivation of contoured corn was practiced by 2 farmers on corn 8 - 10 inches high. They secured a 60% reduction of weeds with no reduction in corn yields. Butane and propane gas were used at cost of 40 cents per acre when purchased in large quantities. This burner throws an invisible flame of 2200°. Works best when weeds are small.

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SOIL FERTILITY AND CONSERVATION RESULTS

Minnesota Mr. Paul Burson's talk will be available some time in March or April, when we will send a copy of it to you.

C. L. Englehorn, U.S.D.A.

Soil Conservation Service research conducted in cooperation with the North Dakota Agricultural Experiment Station is concerned largely with the tillage methods as they may be utilized for soil and moisture

conservation. Particular emphasis has been placed on the proper utilization of crop residues. By maintainance of residue at the surface of the soil by "stubble mulch" tillage soil erosion can be reduced and more moisture is conserved.

When used on summer fallow, stubble mulch tillage has produced as high a yield of wheat as plowed fallow. Here it has the advantage of the protection which it affords the soil which, on plowed fallow, is exposed to the action of wind and water for a long period of time. When used for tillage of wheat stubble land for re-seeding to wheat, stubble much tillage has, in the northern part of the state, produced a lesser yield than plowing. This appears to be due to a lesser amount of available nitrogen under stubble mulch tillage as indicated by the determination of the nitrate-nitrogen content of the soil and the protein determination on the wheat crop. The lesser available nitrogen appears to be due to the fact that the soil temperature is considerably lower under stubble mulch tillage than under plowing, which doubtless has affected bacterial activity and thus nitrification rate.

This, and similar problems, are being investigated in order to be able to develop revision of tillage methods in order to allow complete utilization of soil and moisture accomplishments.

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RESULTS OF COOPERATIVE FERTILIZER TRIALS IN NORTH DAKOTA

North Dakota conducted 52 fertilizer demonstration trials in 22 counties throughout North Dakota in 1947. The purpose of these trials was to assist county agents, secure additional information for the experiment station, and learn more of fertilizer value in the state. The F. H. Peavey Company and International Elevator Company supplied the fertilizer. It was applied chiefly to wheat and corn. Soil was tested prior to fertilizer application and fertilizer was applied to summer fallow or clean corn ground in most cases.

Applications were as follows:

Wheat 0-43 -0-25# per acre - 14% increase
0-43-0-50# per acre - 23% increase
6-30-0-35# per acre - 12% increase
6-30-0-70# per acre - 21% increase

70% of fertilized land showed good response, 15% small response and 15% no response.

Corn was checked at harvest and yield samples taken and air-dried to secure yield information. One man reported the nitrogen phosphate - treated corn tasselled 8 days ahead of other corn and this result seemed generally true in other plots. Nitrogen hastens maturity rather than causing a lush grown when plant food in fair balance.

* * * * *

WHEAT STEM SAWFLY

A survey conducted by the Bureau of Entomology and Plant Quarantine in in cooperation with various state personnel revealed the known range of this insect. The area includes all of Montana east of the Rocky Mountains, all of North Dakota, a portion of northwestern Minnesota, much of Wyoming and South Dakota, and a small area in northern Nebraska. It is anticipated that additional survey data will extend this area.

A map showing intensity of sawfly populations in North Dakota, was presented. Severe infestations (40% or more wheat stems infested) occurred in northwestern and north central counties; moderate infestations (20-40% stems infested) in adjoining areas and extending into isolated southern and eastern regions; light infestations (10-20% stems infested) in small regions near the Red River Valley and in southern areas.

Control measures involving early sub-surface tillage in the fall, crop rotation, planned use of resistant crops and trap strips, offer effective methods for meeting this problem. Early harvesting with swathers prevents excessive losses. The use of Rescue wheat is popular in sawfly areas, but should be recommended with caution.

Tests at North Dakota stations reveal Rescue yields at from 10 to 15% under standard wheat varieties, and this loss is probably greater than losses caused by sawfly. Rescue is also more hazardous because of high susceptibility to leaf rust, questionable resistance to stem rust, and generally weak straw. It is not an entirely satisfactory milling wheat, because of low water absorption. These factors suggest the necessity for caution mentioned above. (Wheat stem sawfly map attached)

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CORN BORER AND CHEMICAL CONTROL REPORTS

T. L. Aamodt (report attached) 6 pages.

Dr. Harold Gunderson

The European corn borer continued its spectacular increase in population and damage in Iowa in 1947. Six hundred stops were made throughout the entire state during the course of the fall survey completed about November 1. These stops showed 37 counties with more than 100 borers per 100 stalks of corn with a high count of 466 borers per 100 stalks as a county average in one county. This compares with 19 counties with more than 100 borers per 100 stalks in 1947 and a high county average of 313 borers per 100 stalks in 1946.

The season was rather unfavorable both for corn and for the European corn borer. A cold wet spring delayed corn planting and delayed the emergence of moths. A hot dry July and August greatly reduced the number of second brood borers that were able to survive. In spite of the

unfavorable weather, however, corn borer damage increased tremendously.

Between 40,000 and 50,000 acres of corn were treated with DDT. Approximately 30,000 acres were treated by airplane, the remainder by ground equipment. Results of application were in general good, returning about 10 bushels of corn per acre increase.

1948 Recommendations:

(1) Choose strong-stalked, strong-shanked adapted hybrids to reduce loss from broken stalks and dropped ears.

(2) Plant corn as soon as practical, to beat uncertain weather and frost in May.

(3) Protect early-planted and late-planted corn (most attractive to borer moths) with DDT. Apply 2 or 3 times at 5 to 7 day intervals with ground or airplane equipment, as spray or dust. Apply 1 lb. pure DDT per acre per application. Sprays slightly more effective than dusts. $2.50 $3.50 per acre per application.

(4) Cooperate with neighbors in destroying all corn crop residue before May 15 by ensiling, shredding or deep clean plowing.

Iowa reported more than 100 corn borers per 100 stalks in the following counties in 1946: Monona, Crawford, Wright, Warren, Worth, Franklin, Hardin, Marion, Mitchell, Floyd, Butler, Mahaska, Chickabaw, Bremer, Winneschiex, Fayette, Clayton, Dubuque and Des Moines. A like proportion was found in the following additional counties in 1947: Grundy, Black Hawk, Buchanan, Delaware, Marshall, Tama, Benton, Linn, Jones, Jackson, Poweshiek, Iowa, Johnson, Cedar, Clinton, Keokuk, Muscatine, Scott and Louisa.

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GRASSHOPPER SITUATION

Dr. F. Gray Butcher

Summaries of fall surveys on grasshopper egg counts have not been released. However, South Dakota representatives report a heavy infestation in central and western districts, North Dakota reports show no heavy infestations but more generally light infestations, and Minnesota shows light to threatening infestations, especially in southern and western counties. Species of major importance appear to be the "differential" and the "red-legged" grasshoppers.

New chemicals for grasshopper control show great promise. Chlordane, a chlorinated camphene, and benzine hexachloride have been used successfully, with the last named material giving somewhat more variable results. When applied direct to infested crops as sprays or dusts, they give quicker control and continue to kill longer than the standard fluosilicate -bran bait. The length of time of their effective residual action depends upon several factors, including weather conditions, type of vegetation, age of the hoppers, etc.

In general chlordane is recommended for use at the rate of one pound

technical grade per acre, chlorinated comphene at 1½ pounds technical grade per acre, and benzine hexachloride at 4 pounds of 10% gamma per acre. Proper timing of applications is important with these materials, and should be made on egg hatching areas before the young hoppers have dispersed. Margins of fields must be treated for effective protection before migrations through-out the field occur. Treatment of strips across infested fields offer promise of effective control in an economical manner.

Further information on the danger of toxic residues from these materials is necessary before general recommendations can be given. Pending such information, direct application to crops intended for livestock feed must be practiced with caution.

While these new chemicals offer more effective measure for protecting certain special crops, their cost at present appears to prohibit their replacing fluosilicate bait in a general regional control program. Especially does this apply to range or idle land areas, where extensive control operations are frequently required.

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DINNER PROGRAM

The evening dinner was held in the Aquatennial room. The film "Pillars of Plenty" was shown and questions answered by Mr. R. C. Woodworth. This is a 35 mm black and white sound film showing grain handling in detail from producer to consumer.

Mr. Woodworth gave a very interesting report of his recent trip to Washington to attend a congressional committee hearing on grain marketing.

December 7, 1947

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TILLAGE PRACTICES

South Dakota practices shallow fall tillage and leaves narrow untilled strips where grasshopper lay eggs. This drives hoppers into untilled areas. After egg laying is completed these strips are tilled to destroy grasshopper eggs.

All agree that corn stalks must be thoroughly and completely plowed under to control corn borer. If not plowed under they must be completely shredded with a special shredder manufactured for this purpose. Ordinary corn shredders, Seaman tillers or similar tools are inadequate and inefficient for borer control.

Use of corn for silage destroys the borer provided corn is cut 4 inches or less from ground line.

* * * * *

SEED TREATMENT SURVEY

R. C. Rose of Minnesota conducted a seed treatment survey in five

Minnesota counties. Double frank post cards were printed and sent to county agents who signed them and mailed to every other farmer on his mailing list. 15% return was obtained from 705 farmers. Information of methods of treatment used showed slightly over 50% farmers used custom treatment at local elevator. He reported 193 seed treaters in local elevators throughout the state. Results are included on the three accompanying tables.

* * * * *

The group agreed that properly calibrated dust dispensers were needed to secure better seed treatment. The following committee was appointed to correlate the suggestions regarding seed treatment machines:

Wm. P. MacDonald, Chairman
R. C. Rose
Dr. F. Gray Butcher
Dr. R. J. Haskell
E. J. Mitchell

The following are the committee recommendations:

This committee is of the opinion that there has not yet been developed properly calibrated dust dispensers which are engineered to deliver seed treatment dusts and grain at comparable rates at all times which are completely satisfactory commercial and farms treaters for the application of seed disinfectants. We believe this to be consensus of the entire conference. We are also of the opinion that disinfectant manufacturers are in a better position to know the characteristics of their product than is anyone else and that they should properly assume more responsibility in the development of both farm and commercial types of treaters.

We suggest that the above expression be conveyed to all seed disinfectant manufacturers by the secretary of the conference.

E. J. Mitchell
R. C. Rose
R. J. Haskell
Wm. P. MacDonald
F. G. Butcher

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Parsons seed saver dust was briefly discussed, and the following table presented:

	Beltsville		Michigan	North Dakota	
Treatment	Teoti sorghum		Bald Rockwheat	Wheat	
	Emergence	% Smut	% Smut	% emergence	% Smut
Parsons Seed Saver	39	4.5	19.2	80.	0.92
New Imp. Ceresan	74	0	2.3	77.7	0.03
Check	46	22.2	38.8	79.6	1.87

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HELMINTHOSPORIUM OF OATS

Reports indicate this disease generally is distributed throughout the midwest. Seed treatment should be practiced even on resistant oat varieties because they are susceptible to smuts.

Mr. R. E. Vaughan of Wisconsin prepared Helminthosporium mounts for his county agents which will assist in educating oat growers in Wisconsin.

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BARLEY AND FLAX REPORTS

Each state discussed barley varieties for their state and their reasons for specific varietal recommendations.

Dr. John Parker discussed the 1948 carlot malting contest and E. J. Mitchell briefly discussed flax varieties. The new flax booklet entitled "New Flax Grower's Guide" is attached.

E. S. Dyas, Iowa
Attached are the results of barley variety plots in 1947 and average for 1946 and 1947.

We still cannot come to definite conclusions about barley varieties.

Montcalm is a new smooth-awned Canadian variety seed of which is being increased but very scarce. Montcalm, like O.A.C. 21, when pearled (de-hulled) shows a portion of the kernels with a bluish color. This color is objectionable to some malsters and brewers but accepted by others.

Tregal is from North Dakota, a selection from cross of Trebi and Regal. Not a malting barley.

Kindred is a plant selection made in 1935 by S. T. Lyken, a farmer at Kindred, North Dakota. Kindred, or "L", barley is now grown more extensively in Minnesota, North and South Dakota, than any other variety. It is rough awned, and has some resistance to stem rust. It is a little weak in lodging resistance, about equal to Wis. 38 and better than Odessa, which is grown in South Dakota. Kindred is satisfactory to malsters.

Mars is a short, early, lodging resistant, smooth-awned variety from Minnesota. Because of its smaller kernel size and low Diastase content, as measured in malting trials, it is not acceptable to malsters. Experience in bad barley years shows it to have some resistance to stem rust and stripe, also blight.

Peatland is an old variety recommended for peat soils. It has some resistance to stem rust and scab and is valued more for parent material in breeding work than as a commercial variety.

C.I. 7326 is from the Iowa Experiment Station, a selection from Velvet x Peatland. It has yielded well at the Iowa station but was consistently low in yield in north and northwest Iowa in 1947.

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STANDARD COMMUNITY GRAIN TRIALS
BARLEY SUMMARY 1946 and 1947

Agron. 79h

Date ripe, height, lodging percentage, bushel weight and acre yield of ten barley varieties grown the Standard Community Grain Trials in Northern, Central and Southern Iowa, 1946 and 1947.

		NUMBER REPORTS	AVERAGE ALL VARIETIES	VARIETIES									
				MONT-CALM	TREGAL	KINDRED	PEATLAND	OAC-21	MARS	ODESSA	WIS-38	CI 7326	MANCHURIA
DATE RIPE (In July)													
Northern Iowa	1947	1	27.2	28	29	29	25	27	23	25	31	29	26
	1946	4	22.9	24	22	24	24	22	20	22	26	-	22
Central and Southern	1947	2	19.6	20	21	21	18	18	18	20	22	19	19
	1946	1	10.5	11	11	14	10	9	8	10	13	9	10
HEIGHT (Inches)													
Northern Iowa	1947	6	35.9	37	33	35	37	37	33	35	36	39	37
	1946	8	30.4	32	28	29	32	32	27	31	32	-	31
Central and Southern	1947	5	30.5	32	28	30	32	32	26	30	30	33	32
	1946	1	35.4	37	35	34	35	37	34	35	35	37	35
LODGING (Percentage)													
Northern Iowa	1947	5	8.6	10	3	18	2	11	0	23	10	3	6
	1946	8	7.2	8	2	5	2	10	1	16	12	-	9
Central and Southern	1947	5	0	0	0	0	0	0	0	1	0	0	0
	1946	1	2.8	0	0	15	0	0	0	10	0	0	0
BUSHEL WEIGHT (Pounds)													
Northern Iowa	1947	6	44.05	44.0	42.2	44.4	46.7	43.7	45.3	42.5	42.7	46.0	43.0
	1946	10	40.13	40.4	39.4	40.7	41.0	39.9	42.1	39.4	38.7	-	39.6
Central and Southern	1947	6	43.15	43.2	41.1	43.6	44.9	42.3	44.5	43.0	41.4	45.0	42.5
	1946	1	41.17	41.5	37.8	40.5	40.0	39.8	45.8	40.2	39.5	44.5	41.7
ACRE YIELD (Bushels)													
Northern Iowa	1947	6	40.01	43.1	43.4	41.2	43.7	41.2	42.3	39.0	39.6	33.7	34.3
	1946	10	47.12	51.5	50.2	50.2	45.8	50.2	46.9	48.4	48.5	36.2	43.3
Central and Southern	1947	6	28.73	30.2	30.8	28.6	27.2	29.9	29.2	29.2	27.9	28.1	26.1
	1946	1	53.92	57.4	54.3	56.6	59.0	56.3	52.8	50.5	46.9	48.8	41.1
Average 1946-47		23	42.28	45.55	44.67	44.15	43.98	43.05	42.80	41.78	40.82	36.80	36.20

REPORT ON THE GRADING OF GRAIN AT TERMINAL MARKETS

W. B. Combs

Beginning with the 1943 crops annual summaries showing the grades and classes of grains that are available. These reports in addition to indicating the general quality through numerical grades also show the incidence of smut, garlic, weevils, mixed classes and blighted barley. The summaries for the 1946 crop are now being processed. 1943-45 reports are available, on request.

Other publications available for educational uses include leaflets on the grading of wheat, oats, corn, barley, grain sorghums, soybeans and flax seed and a third summary of the grain grading Primer now in the printing office.

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A motion was made by Mr. Leonard Ladd and seconded by Mr. R. C. Rose that a letter be sent to Mr. P. B. Hicks, Chairman of the Board of Governors of the Northwest Crop Improvement Association, thanking them for the excellent dinner given by their association to the conference members Saturday evening, December 6th; also for the help of Mr. Henry O. Putnam as chairman of the program committee, in arranging the program, the hotel arrangements for the meetings and the many details that made this conference a success.

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1948 MEETING

Motion made by U. J. Norgaard, seconded by L. A. Jensen that H. O. Putnam serve as chairman of Program committee for 1948 and a representative committee be selected to cover subject matter for the six states.

Motion carried.

PROGRAM COMMITTEE

H. O. Putnam, Chairman	
Ralph Mercer	Montana
F. Gray Butcher	North Dakota
Leonard Ladd	South Dakota
Paul Burson	Minnesota
Geo. Briggs	Wisconsin
E. P. Sylwester	Iowa
Willis B. Combs	U.S.D.A.

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
Bureau of Entomology and Plant Quarantine

I N S E C T P E S T S U R V E Y

Special Supplement (1948, No. 2) Issued March 25, 1948

STATUS OF THE WHEAT STEM SAWFLY IN 1947

By E. G. Davis
Division of Cereal and Forage Insect Investigations

A survey of the Northern Great Plains was begun during the latter part of 1947 to ascertain the area infested by the wheat stem sawfly (Cephus cinctus Nort.)1/. Just previous to this survey the known sawfly-infested area comprised the northern portion of Montana east of the Rocky Mountains and the northwestern part of North Dakota. Although it was possible to survey only the northern portion of the Northern Great Plains by the end of the year, this territory was so generally infested that the survey added greatly to the known area of infestation.

Survey data were secured by means of samples taken in wheat and native grasses. From one to ten field stops were made per county and samples were taken in the margins of the wheat fields or in grasses adjacent thereto. Approximately 100 wheat stems per field were examined and the percentage of stems infested was noted. Native grasses were checked for the presence or absence of sawfly larvae.

General Distribution

The general area found to be infested at the end of 1947 comprised nearly all of Montana east of the Rocky Mountains, all of North Dakota, the northern portion of the Red River Valley of Minnesota, a considerable portion of Wyoming, the north-central part of Nebraska, and a section of South Dakota. This area is shown on the accompanying map. It is likely that future surveys will reveal the presence of the sawfly in much of the area of Wyoming and South Dakota where no survey was made or where no infestation was found in 1947. It also seems probable that the infestation extends farther south into Nebraska and Colorado, and possibly into Kansas.

1/ The 1947 wheat stem sawfly survey was conducted by the Bureau of Entomology and Plant Quarantine in cooperation with the following agencies: Montana Agricultural Experiment Station, North Dakota Agricultural Experiment Station and Extension Service, Office of the State Entomologist of Minnesota, and the Northwest Crop Improvement Asscciation.

Heaviest Infestations Found in Montana and North Dakota

The most heavily infested areas were found in Montana and North Dakota. That portion of the map showing the heavily infested areas of Montana was prepared by J. A. Callenbach, of Montana State College, from records previous to 1947. It will be observed that a large heavily infested area extends from the northeastern corner of Montana across much of the northern half of North Dakota. Several smaller concentrations appear in these two States. The remainder of the sawfly territory was only lightly infested.

Sawfly populations were extremely light along the eastern edge of the infested area. Extensive searches were necessary at each stop in this area to detect the presence of the sawfly larvae. This condition prevailed in the Red River Valley of North Dakota and Minnesota, and along the eastern edge of South Dakota. It also appeared to be true of the northeastern part of Nebraska.

Wheat Found Infested Over Much of the Area Surveyed

The sawfly was found attacking wheat throughout most of the surveyed area, including practically all of Montana east of the Rocky Mountains, nearly all of North Dakota, the northwestern portion of South Dakota, and several counties in Wyoming. In a number of counties, mostly along the eastern edge of the sawfly territory, infestations were found only in native grasses. A number of these counties may eventually be found to contain infestations in wheat.

The Sawfly as a Threat to Wheat in the Winter Wheat Belt

The sawfly is now known to be present along the northern edge of the Winter Wheat Belt. This point was established during a survey made in the south-central part of South Dakota and the north-central part of Nebraska. The sawfly has not yet, however, been found attacking wheat in this section of the country. Survey records to date have only indicated native grasses as hosts. In Tripp County, S. Dak., heavily infested western wheatgrass plants were found interspersed among sawfly-free winter wheat plants.

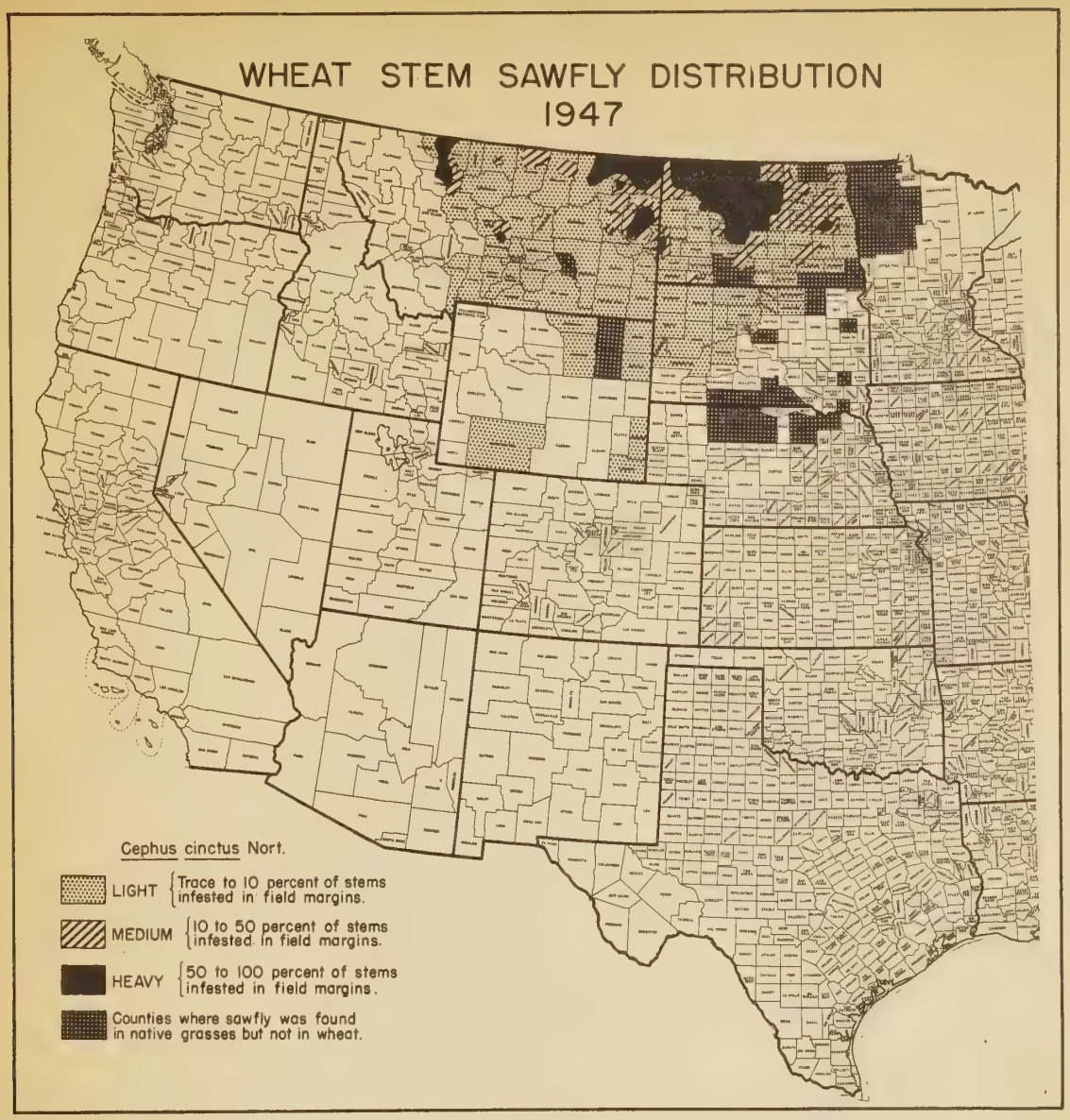
The question logically arises as to why the sawfly has not attacked wheat in the winter-wheat section, particularly since farther north in Montana winter wheat is readily attacked. Three probable reasons why the sawfly has failed to attack winter wheat in this region are as follows: (1) The wheat plants may be resistant to the sawfly; (2) the native grasses may be more suitable as host plants at the time of egg deposition; and (3) the sawfly present in the Winter Wheat Belt may be a different species or variety from the one attacking winter wheat in Montana. The last point is now being investigated.

Host Plants of the Wheat Stem Sawfly

Several native grasses have been found to serve as host plants of the wheat stem sawfly. These grasses have been determined by H. E. Morris of Montana State College as follows:

Agropyron cristatum (L.) (crested wheatgrass)
Agropyron repens (L.) (quackgrass)
Agropyron smithii Rydb. (western wheatgrass)
Agropyron tenerum (Schwein) (slender wheatgrass)
Bromus inermis Leyss. (smooth wheatgrass)
Bromus secalinus L. (chess)
Calamovilfa longifolia (Hook.) (sandgrass)
Elymus canadensis L. (wild ryegrass)
Phleum pratense L. (field timothy)

Most of these grasses were observed at one time or another to be readily attacked. The wheatgrasses, owing to their wide distribution, appeared to make up the greatest percentage of the native grasses being used as host plants.


WHEAT STEM SAWFLY DISTRIBUTION
1947
Cephus cinctus Nort.
LIGHT
Trace to 10 percent of stems infested in field margins.
MEDIUM
10 to 50 percent of stems infested in field margins.
HEAVY
50 to 100 percent of stems infested in field margins.
Counties where sawfly was found in native grasses but not in wheat.

Grain Acreage on Surveyed Farms 1947

County	Number of Acres Seeded							
	Wheat		Oats		Barley		Flax	
	Total	Treated	Total	Treated	Total	Treated	Total	Treated
Kittson	15681	15214	2419	2080	10923	10208	4195	3506
Norman	5996	5200	7478	5287	6012	4898	2314	1706
Lac qui Parle	1078	992	6154	5338	1551	1166	3736	3159
Nobles	53	47	5327	4757	292	252	2108	1830
Mower	190	144	6332	5820	361	336	317	273
Total 5 counties	22998	21597	27710	23282	19139	16860	12670	10474
Per cent of acres treated 5 counties		93.4		84.		88.		82.6

Individual Farm Reports 1947

County	Number of Farms Reporting Grain							
	Wheat		Oats		Barley		Flax	
	Total	Treated	Total	Treated	Total	Treated	Total	Treated
Kittson	97	87	67	59	87	82	53	43
Norman	112	98	119	98	99	84	58	41
Lac qui Parle	59	54	146	136	60	52	108	89
Nobles	3	2	114	110	13	11	56	49
Mower	23	19	169	165	26	23	19	18
Total 5 counties	294	260	615	568	285	252	294	240
Per cent farmers treating all or part		88.4		92.3		88.4		81.6

Farmers Opinions on Results of Treatment and Attitude on Custom Service

Counties	Farms Surveyed		Benefit from Treatment 1947 (Farmer's Opinion)			Attitude toward Custom Treating of Farmers Treating in 1947		
	Total	Treating seed	Yes	No	Uncertain	Favorable	Unfavorable	Uncertain
Kittson	107	102	82	3	17	45	5	52
Norman	139	126	91	6	29	38	4	84
Lac qui Parle	162	151	99	27	25	59	7	85
Nobles	122	112	99	9	14	59	4	49
Nower	175	166	122	17	27	73	18	75
5 counties	705	657	493	62	112	274	38	345
Percentages		93.%	75.%	9.4%	17.%	41.7%	5.8%	52.5%

Circular 118
January 1948

STATE OF MINNESOTA
DEPARTMENT OF AGRICULTURE, DAIRY AND FOOD
BUREAU OF PLANT INDUSTRY
University Farm, St. Paul 1, Minn.

EUROPEAN CORN BORER

Introduction

The rapid spread of the European corn borer in this state indicates it has found favorable conditions here. Only the northernmost row of counties remain uninfested and in just one year, in especially southern and eastern counties, the population has risen from inconsequential numbers, causing little or no loss to high populations causing losses in the millions to farmers and a serious threat to the corn crop in the state.

Description and Seasonal History

The larvae of the corn borer overwinter in a tunnel in the stalk, stubble, ear of corn, or in some weed growing close to corn. These larvae are about an inch and a quarter in length with a dark brown or black head. The body color is usually dirty grey, but ranges from dark brown to pink. Each division of the body bears a row of small brownish spots and the underside is free from markings. Late in May, these overwintering larvae change to a resting or pupal stage. The pupa is shuttle-shaped, varying in color from light to dark brown. After 10 to 14 days, or normally in late June, the moths emerge from the pupal cases. The general color of the moths is tan, but is variable, ranging from light brown to pale yellow. There are two narrow dark zigzag lines on the outer half of the wings. The moths remain quiet during the day, hiding in patches of weeds and grass, or under surfaces of corn leaves. Eggs are laid during the evening in flat irregularly shaped masses of from 5 to 50 eggs on the undersurface of the corn leaf, usually along the midvein. The eggs hatch in 4 to 7 days after deposition. The hatching time can be estimated easily by observation in that the eggs show a dark spot just before hatching, due to the dark color of the head of the larvae within. Most of the moths in Minnesota go through two generations a year, with eggs being laid the latter part of June and the latter part of August.

Characteristic Injury by the Corn Borer

The young larvae feed first on the leaves, causing a shot hole appearance by eating out small holes. They then migrate to the developing whorl and feed in the protection of the leaf sheath, leaving sawdust-like borings behind. If tassels are developing, some borers may enter the tassel buds to feed, or feed right on the outer surface. The tassel stem is often entered, causing the tassel to break over. This is a conspicuous sign of infestation in growing corn fields, but is not necessarily always found. The borers then continue tunneling in the main stalk on any portion of it, usually entering from between a leaf sheath and stalk, or between the stalk and partly-developed ear. Most larvae then burrow upward in the stalk. Small holes in the stalk with sawdust-like borings at or below the holes indicate the section of the stem attacked. The ear may also be entered in any stage of development. The damage to the plant is largely from a cutting off of the supply of nutriment in the plant and a weakening of the stalk, causing breakage. Injury to stalks and ears may be further increased by decay which often follows the work of the borer.

Occasionally other plants than corn may be attacked. Such more or less rare hosts include celery, rhubarb, potato, dahlia, chrysanthemum, gladiolas, aster, zinnia, cosmos, geranium, swiss chard, oats, and certain weeds.

Cultural Control Methods

The vulnerable point in the life cycle of this insect is the overwintering larval stage. There are certain cultural practices which destroy the larvae before they reach the adult stage. Regard-

less of the method used for controlling these larvae, one necessary factor to seriously consider is community effort. Although the majority of the farmers in an area may be conscientiously employing all means available, just one neglected field in the neighborhood can almost nullify that work and bring on a serious infestation. The flight range of the adult moth has been shown to be in excess of 20 miles.

One of the most effective methods of controlling this insect is to remove all weed and crop residues from the surface of the soil and the best way to accomplish this is by plowing deeply and cleanly. This residue must be buried so completely that later seed bed preparation will not drag it to the surface. The soil must be sufficiently pulverized to close all cracks and crevices which might expose turned under trash. Plowing itself does not kill the borers. In fact, most of them leave the buried residue and crawl to the surface. There they seek new shelter in any kind of exposed debris. But if plowing is well done, the larvae are unable to find suitable shelter and soon succumb to the weather or predators and natural enemies.

Good trash coverage requires the use of a moldboard plow with at least a 14 inch bottom. The moldboard must scour readily and be shaped to suit the type of soil and the speed at which it is pulled. The coulter should be properly adjusted and large and sharp enough to cut through all trash. Large notched rolling coulters of 16" to 18" diameter are very effective in cutting trash and do not clog easily. Jointers of either the moldboard or disk type are essential. The moldboard type must be kept properly adjusted and repaired or replaced when wear interferes with the operation. Either wires, shields, or chains can be attached to the plow to assist in covering up debris. One or more wires can be used for each bottom. From 10 to 12 feet of No. 8 or No. 9 wire is usually enough. The wire is attached to the extreme lower end of the rolling coulter shank and if a second one is used, it is attached just above the offset in the coulter shank. These wires are held taut beneath the turned furrow and guide the trash underneath.

In hand picked corn fields, the stalks can usually be readily covered without previous disking or leveling and the plowing can be in either direction. In machine picked fields, good trash coverage occurs only when the plow is going in the same direction the picker was driven. Such machine picked fields can be double disked to facilitate the plowing. In the case of corn cut by binder or for ensilage, a low cutting attachment cutting the stalks at ground level removes the majority of the infested stalk portion and aids in clean plowing.

Experience with the corn borer has shown the desirability, whenever possible, of disposing of infested plant residues in the fall. This applies particularly to fields intended for seeding to small grain. These often cannot be successfully prepared for such crop by spring plowing. Although both fall and spring plowing have proven effective in controlling borers, there is a special caution in the case of spring plowing. Such plowing must be completed by the last week in May, before emergence of moths begins.

Some of the best weapons for control are the modern field ensilage harvesters and the hammer and roughage mills. Few borers escape the knives and hammers and those that do usually perish when the fodder is stored and used.

A proper planning of crop rotations materially assists in borer control. Especially bad is the practice so common in some areas of disking in oats after corn. Disking allows a very high percentage of the borers to survive. If soil conditions require early sowing of winter grains on unplowed corn land, there are two partial remedies available. The corn stalk can be cut as low as possible and all the residues disposed of before moth emergence. A second procedure would be to follow a corn-soybean-small grain-clover rotation. The land can be plowed for soybeans and the grain drilled in after the soybeans.

Feed lots can easily become a source of infestation. If the remaining stalks are not completely trampled, they must be gathered up and destroyed before moth emergence. Manure piles may be sources of infestation if cornstalks are allowed to accumulate there. Borers buried in the manure simply move to the surface and seek some convenient shelter to complete the transition. If infested material must be placed in such piles, the manure should be spread and plowed under before the borers become active in the spring.

Burning is sometimes used for disposing of borer infested cornstalks and other residue which cannot be fed or plowed under. This is not a desirable agronomic practice, since it sacrifices soil

fertility by destroying valuable organic matter. Therefore, it should be used only as a last resort if no other method is possible.

Biological Control

Parasites are an important supplemental means of control, but cannot be expected to do a complete job of controlling the corn borer larvae. This type of control can only be considered as a long-range program for helping to control corn borers in the future. These parasites must all be reared, introduced into an area, and there allowed to establish themselves and build up a population. This takes time and introductions made up to this time cannot be expected to afford much immediate relief. Two of the species which were introduced in previous years have apparently established themselves in Minnesota.

Chemical Control

The first consideration for chemical control of this insect is that of the proper timing of insecticidal application. The young corn borer larvae are most susceptible to insecticidal action for a short period after hatching and before they have crawled inside a protective leaf sheath. With adequate penetration, some of these concealed larvae can be killed. Since the large larvae also migrate over the plant to some extent, they may be killed, but not nearly so easily. Therefore, to obtain the best control, an insecticidal layer must be present on the plant during the time the larvae are hatching and before they reach the protective sheath.

Several methods of timing the first application have been proposed in other states in which the corn borer has been present for several years. A guide for proper timing, modified for Minnesota conditions, is as follows:

Number of insecticidal applications for first generation control	Time of first application	Time interval between treatments
1	Corn 25-30 inches tall 7-10 days after first hatch	
2	Corn 22-26 inches tall 3-5 days after first hatch	7-8 days
3	Corn 20-22 inches tall 2-3 days after first hatch	6-7 days
4	Corn 18-20 inches tall just as eggs first hatch	5-6 days

This is the most practical means of timing available. Corn heights are as the plants stand in the field. The life cycle of the insect is usually fairly coincidental with the development of the corn plant, and egg masses placed on plants under 18 inches in height have a relatively poor chance of producing surviving larvae.

Careful tests over a period of years have shown that the law of diminishing returns applies to the number of treatments. Application of two treatments does not necessarily provide twice as good a control as one, nor are four treatments twice as good as two. If egg hatch occurs over a short period of time and the insecticidal application is timed to coincide with this hatch, a fairly good control can be expected with one treatment. If egg hatch occurs over a period of several weeks, more than one treatment may be required. Exposure of new leaves on the plant and the effects of weathering reduce the efficiency of the insecticidal layer so that replacement is necessary at approximately weekly intervals to maintain efficiency of treatment. In some detailed experiments during prolonged hatching, a two-treatment program gave up to 79% control and a four-treatment program up to 92% control. The number of treatments required must be determined by the grower himself through careful observation of the condition of his fields and the percentage of egg hatch which has taken place. It is recommended that at least one insecticidal application be made on field corn and at least two on sweet corn in heavily infested fields in the south central and southeastern portions of the state.

Another means of timing is by counts of the number of egg masses per 100 plants. These egg masses may be located on any portion of the plant or any leaves, but they are usually found on the under leaf surface along the midrib. In field corn, if 50 egg masses are found per 100 plants, insecticides should be applied. In sweet corn, 25 egg masses per 100 plants is enough to warrant

control applications. When these egg masses are laid, they are a translucent white color. From 5 to 50 eggs are laid, overlapping like fish scales, in flat irregularly shaped masses. When a dark center develops in each egg, hatching of the eggs will occur in a short period. This black spot is the head of the newly formed larva. In using this method of timing, insecticidal application is begun just after these black spots appear and the eggs begin hatching. If field observation shows the hatching period is extending over a week, a second or third application may be necessary at weekly intervals.

These two methods should be used in conjunction. The height of the corn will indicate when counts should be made and approximately the time for insecticidal application. The number of egg masses and their condition would indicate whether application is justified and verify the time of application.

The next consideration is the insecticide which should be used. The most generally used and recommended material is DDT.

There are other new organic insecticides which have been tested and which have given approximately comparable control to DDT. The use of these chemicals would be governed by their availability and cost. None of them has proven outstandingly more successful than DDT, and consequently until availability and cost figures more closely approximate those of DDT, their use cannot be especially recommended during hhe 1948 season on the basis of present information available.

The type of formulation to be used is governed by the type of machinery available for application. The most widely used and most easily applied formulation is the 5% DDT dust. This is applied at the rate of 35 lbs. per acre.

If a spray is to be used, the 25% DDT oil emulsion can be used at the rate of 2 quarts of this material per acre. This solution is diluted with water according to the capacity of the sprayer. If this material is used as a low gallonage, high concentration spray, it is recommended the user procure a guarantee that the solvent used in the emulsion is non-toxic to plants and will not injure foliage if applied in strengths of over 5%.

The 50% wettable DDT powder may be used at the rate of 3 lbs. per 100 gallons of water per acre. Although lesser amounts of water can be used, in general the best results have been obtained by using a dilute spray at high pressure and applied at the rate of 75 to 100 gallons per acre. Better results are also obtained with this material when a spreader, such as calcium caseinate or soybean flour, has been added.

Another insecticide recommended for use if available is Ryania. This may be applied as 37% Ryania dust at the rate of 40 lbs. per acre or as a spray at the rate of 4 lbs. Ryania per 100 gallons of water per acre.

Summary of Recommendations

Material	Rate per acre
5% DDT Dust	35 lbs.
37% Ryania dust	40 lbs.
25% DDT oil emulsion	2 qts. in up to 50 gal. water, depending on sprayer capacity
50% DDT wettable powder	3 lbs. in up to 100 gal. water with spreader
Ryania (pure ground)	4 lbs. in up to 100 gal. water

Methods of Application

The next consideration is the method of application. The method will be governed largely by the type of machinery which is available or usable at the time application must be made. Generally speaking, a ground spray machine is the most efficient, a ground duster next, and airplane dusting or spraying third. The differences in efficiency are so slight, however, that any method is usable which is available.

Almost any type of crop duster or sprayer which is on hand can be adapted in some way for use in applying insecticides on corn. A spray outfit should have two or three solid cone nozzles per row adjusted so as to provide a drenching application for the upper leafy portions of the plant. The maximum pressure available will give the best results through driving the spray into the leaf

whorl. Low gallonage weed sprayers can be adapted by replacing the boom with nozzles arranged as described. In this case, the 25 per cent oil emulsion would be the only usable insecticide applied at the rate of 2 quarts per acre. This should be diluted as much as possible with water and the precautions stated with this formulation in a previous paragraph should be especially noted.

Crop dusters and especially row crop dusters can easily be adapted with 2 dust nozzles per row so as to thoroughly cover the corn plants. There should be some means of estimating the dust output of the machine per acre.

Hand dusters or sprayers can be used effectively in the small garden plot.

The question of clearance of ground machinery often arises. Experiments have shown that applications can be made with tractor drawn equipment against the first generation corn borer without serious damage. If application is made in the evening, the corn plants are less turgid and more supple, thereby permitting use of as low as 20 inch tractor clearance with only inconsequential breakage.

The use of airplanes for dusting and spraying has a definite place in the control program. Where large acreages must be covered in a short period of time, airplanes are most effective. During wet seasons, it often becomes impossible to use ground machinery at the time insecticidal applications must be made. In such circumstances, an airplane application is the only means available.

Sweet corn presents a slightly different problem in general than field corn, particularly because of the two generations of borers present in this state. Because of differences in growth rates between field and sweet corn, applications of insecticides on sweet corn must be repeated at 5 day intervals rather than the week to 10 days permissible for field corn. The second generation of borers generally does not cause as great a damage to field corn as to sweet corn, and control operations for this generation in the former are not generally recommended. In the case of this second generation, airplane application of the insecticides is the most feasible means, since ground machinery other than specially built high clearance machines would cause too great a breakage. Timing for this application must be governed by egg mass oounts and condition of the eggs. Otherwise, the control recommendations remain the same.

The possible effects of insecticidal residues on treated plant materials used for feed or food must be kept in mind. When fodder containing DDT or other organic insecticides is fed to livestock, it accumulates in the body tissues, especially the fatty tissues. It is still uncertain whether the amount of DDT found in milk or in fatty tissues would be ruled a hazard to human health. Because of these circumstances, the only alternative is to recommend that crops treated with these organic insecticides should not be fed to livestock.

Resistant Varieties

No commercial variety of corn available is immune to corn borer attack. A number of Minnesota varieties and strains are being tested at the U.S.D.A. Corn Borer Research Laboratory at Toledo, Ohio for resistance or tolerance to the corn borer. This is a long time program, and although some strains have shown considerable promise, it will be a number of years before such strains will be released.

Generally speaking, hybrids are much more tolerant to attack than open pollinated corn, mostly because the sturdier, stronger stalks are more resistant to breakage and generally more vigorous. In more southern states, it has been found to be a desirable practice to raise corn of earlier maturities in order to delay planting time. A delay in normal planting time of a week to 10 days often serves to help a field escape heavy egg deposition by the moths. The females have been demonstrated to be quite selective in laying their eggs, in that the heaviest egg deposition is made on the fields most advanced in growth. For this reason, such hybrids which will mature when they are planted moderately late within the normal planting period are desirable from the viewpoint of escaping borer infestation. However, such a practice cannot be generally recommended for Minnesota because of the danger of corn failing to mature in time to escape early fall frosts.

Any requests for further information on corn borer or other insect control should be addressed to the Department of Agriculture, Dairy and Food, Bureau of Plant Industry, University Farm, Saint Paul 1, Minnesota.

MINNESOTA STATE DEPARTMENT OF AGRICULTURE, DAIRY AND FOOD
BUREAU OF PLANT INDUSTRY
OFFICE OF STATE ENTOMOLOGIST
Room 300 Administration Building
University Farm, St. Paul 1, Minnesota

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Circ. 117

The Abundance of the European Corn Borer in Minnesota in 1947 as Compared With 1945 and 1946

County	Average number borers per 100 plants 1945	1946	1947	County	Average number borers per 100 plants 1945	1946	1947
Anoka	-	-	55.6	Mille Lacs	-	-	20.8
Benton	-	-	7.6	Morrison	-	-	4.5
Big Stone	-	-	10.0	Mower	0.6	3.2	232.0
Blue Earth	-	38.8	460.0	Murray	-	-	8.0
Brown	-	3.2	154.6	Nicollet	-	13.0	116.8
Carver	-	-	224.8	Nobles	-	-	38.0
Chippewa	-	-	10.0	Olmsted	2.6	4.6	477.0
Chisago	-	-	32.0	Pine	-	-	14.0
Cottonwood	-	-	63.8	Pipestone	-	-	0.4
Dakota	1.2	4.8	267.3	Pope	-	-	0.0
Dodge	2.0	2.0	244.4	Ramsey	-	-	43.0
Douglas	-	-	1.2	Redwood	-	-	76.2
Faribault	0.4	5.8	160.4	Renville	-	-	83.0
Fillmore	5.0	4.0	215.4	Rice	0.0	8.4	385.8
Freeborn	0.4	19.6	430.2	Rock	-	-	20.4
Goodhue	3.6	17.2	420.2	Scott	-	8.0	356.8
Grant	-	-	0.0	Sherburne	-	-	55.6
Hennepin	-	-	94.4	Sibley	-	-	47.4
Houston	9.0	19.4	179.0	Stearns	-	-	3.2
Isanti	-	-	43.6	Steele	0.0	5.4	618.2
Jackson	-	-	83.0	Stevens	-	-	0.0
Kanabec	-	-	5.2	Swift	-	-	4.4
Kandiyohi	-	-	15.2	Todd	-	-	6.0
Lac quo Parle	-	-	13.2	Traverse	-	-	0.0
Le Sueur	3.0	13.0	94.8	Wabasha	2.4	7.4	169.4
Lincoln	-	-	0.0	Waseca	0.0	3.2	437.4
Lyon	-	-	1.2	Washington	-	0.4	88.0
Martin	0.8	2.4	81.4	Watonwan	-	3.8	174.6
McLeod	-	-	65.0	Winona	0.0	16.6	222.2
Meeker	-	-	15.6	Wright	-	-	43.6
				Yellow Medicine	-	-	8.0
				State average	1.9	8.6	117.8

MINNESOTA CORN BORER LOSS STATISTICS, 1947
Prepared by State Entomologist's Office

County	No. Damaging Borers per 100 plants	Per cent loss	Decrease in bushels	Average Loss Per Farm	Total County Loss
Anoka	66.4	1.99	20,417	$ 33.61	$ 46,959
Big Stone	10.4	0.31	7,068	15.75	16,256
Blue Earth	302.0	9.06	459,614	364.40	1,057,112
Brown	132.0	3.96	154,543	177.72	355,448
Carver	200.0	6.0	102,372	155.70	235,455
Chippewa	10.0	0.3	12,996	15.92	29,890
Chisago	26.4	0.79	84,056	101.22	193,328
Cottonwood	54.4	1,63	75,257	90.52	173,091
Dakota	158.0	4,74	115,096	126.96	264,720
Dodge	240.2	7.21	176,169	234.48	405,188
Faribault	153.0	4.59	253,606	238.96	583,293
Fillmore	215.4	6.46	227,805	174.71	523,951
Freeborn	430.2	12.9	595,593	475.65	1,369,863
Goodhue	317.2	9.52	267,702	221.00	615,714
Hennepin	72.4	2.17	32,489	25.14	74,724
Houston	178.0	5.34	81,980	105.86	188,554
Isanti	43.6	1.31	11,399	14.19	26,217
Jackson	68.4	2.05	114,124	117.49	262,485
Kandiyohi	11.6	0.35	15,029	14.13	34,566
Lac qui Parle	13.2	0.4	20,185	38.85	46,425
Le Sueur	72.4	2.17	52,527	58.87	120,812
Lyon	2.4	0.07	3,910	4.65	8,993
Martin	66.6	2.00	123,120	114.41	283,176
McLeod	53.6	1.61	44,661	41.31	102,720
Meeker	15.6	0.47	15,002	14.52	34,504
Mille Lacs	20.8	0.62	4,547	5.46	10,458
Morrison	9.0	0.27	4,668	3.22	10,736
Mower	232.0	6.96	279,026	265.41	641,759
Murray	5.6	0.17	9,031	10.22	20,771
Nicollet	102.6	3.08	79,821	125.23	183,588
Nobles	36.8	1.11	64,957	70.37	149,401
Olmsted	458.0	13.74	444,846	453.12	1,023,145
Pine	9.6	0.29	2,104	1.52	4,839
Redwood	77.0	2.31	156,073	134.60	358,967
Renville	73.61	2.21	152,003	113.73	349,606
Rice	268.6	8.05	200,364	210.81	460,837
Rock	16.4	0.49	20,277	34.64	46,637
Scott	277.6	8.33	131,364	192.81	302,137
Sherburne	47.6	1.43	19,617	41.82	45,119
Sibley	41.6	1.25	40,517	41.71	93,189
Stearns	1.6	0.05	2,251	1.15	5,177
Steele	593.0	17.79	463,073	576.64	1,065,067
Swift	4.4	0.13	5,705	7.28	13,121
Todd	6.4	0.19	4,527	2.88	10,412
Wabasha	160.4	4.81	84,078	123.41	193,379
Waseca	401.2	12.03	335,998	467.23	772,795
Washington	55.2	1.66	21,132	30.13	48,603
Watonwan	162.4	4.87	167,294	267.58	384,776
Winona	216.6	6.50	112,879	135.29	259,621
Wright	43.6	1.31	39,575	25.27	91,022
Yellow Medicine	5.4	0.16	8,937	9.70	20,555
					$13,631,092

Note: The State Entomologist's Office based these figures on an estimated average yield of 38 bushels per acre and on 1946 acreage. Loss figures are also based on corn at $2.30.

MINNESOTA STATE DEPARTMENT OF AGRICULTURE, DAIRY AND FOOD
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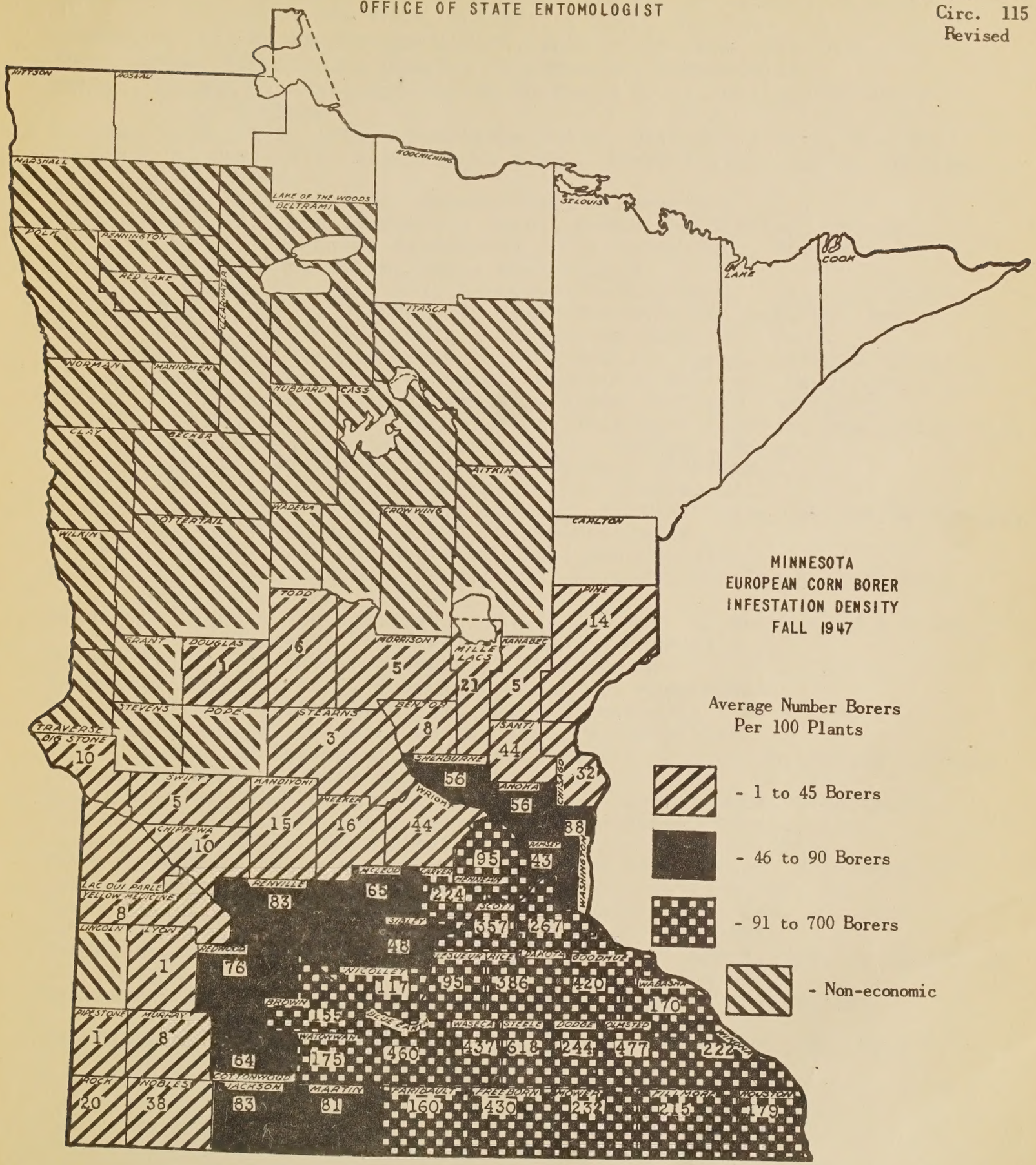

Aamodt, T. L., Director and State Entomologist, Department of Agric. Dairy and Food, University Farm, St. Paul.
Armour, M. L., Extension Agronomist, University Farm, St. Paul
Arms, Lloyd, Minneapolis Chamber of Commerce, Minneapolis
Briggs, George M., Ext. Specialist in Field Crops, College of Agric. Madison
Burson, P. M., Ext. Assoc. Professor Soils, University Farm, St. Paul.
Butcher, F. Gray, Ext. Plant Path. & Ext. Entomologist, Agric. College Fargo.
Clark, E. R., Federal Grain Supervision, Minneapolis
Combs, Willis B., Ext. Marketing Spec., Extension Service, Chicago.
Crim, Ralph F., Extension Agronomist, University Farm, St. Paul.
Crosby, Tom, General Mills, Inc., Minneapolis
Dietrich, Irvine T., Ext. Soil Conservationist, Agric. College, Fargo.
Duncan, E. B., Agric. Department, Great Northern Railway, St. Paul
Dunham, R. S., Assoc. Agronomist, University Farm, St. Paul.
Englehorn, C. L., Project Supervisor, U.S.D.A., Agric. College, Fargo.
Fisher, O. S., Extension Agronomist, Extension Service, Washington, D.C.
Gilbert, C. J. Assoc. Weed Supervisor, Agric. College, Brookings.
Haskell, R. J., Ext. Plant Pathologist, Extension Service, Washington, D.C.
Jensen, L. A., Extension Agronomist, Agric. College, Fargo
Johnson, Dwight, South Dakota Agric. College, Brookings.
Johnson, Ray, Flax Institute of the U. S., Minneapolis.
Ladd, Leonard, Ext. Soil Conservationist, S. Dak. State College, Brookings.
Leary, Wm. J., Northrup King and Co., Minneapolis.
Mitchell, E. J., Flax Institute of U.S., Minneapolis.
Miesen, A. R., Agricultural Department, Northern Pacific Railway Co., St. Paul.
Melander, Leonard, Pathologist, U.S.D.A., Bureau of Entomology & Plant Quarant. Fed. Office Bldg., Minneapolis.
Mayer, W. O., Dow Chemical Company, Minneapolis.
MacDonald, Wm. P., F. H. Peavey and Company, Minneapolis.
McCaull, R. N., Pillsbury Mills, Inc., Minneapolis
Nightingale, W. I., General Mills, Inc., Minneapolis
Norgaard, U. J., Extension Agronomist, S. Dak. Agric. College, Brookings.
Newell, Cameron, Farmers Union Grain Terminal Assoc., St. Paul.
Oberhauser, Joe, Milwaukee Railway Company (Agric. Dept.) Minneapolis
Putnam, Henry O., Northwest Crop Imp. Association, Minneapolis
Parten, Herb. Exten. Entomologist, University Farm, St. Paul
Parker, John H., Midwest Barley Improvement Association, Milwaukee
Robinson, R. G., Agronomy Department, University Farm, St. Paul
Rose, R. C., Plant Pathology Department, University Farm, St. Paul
Schroeder, Cliff, C. B. Lyon Chemical Company, St. Paul
Sanderson, Elmer E., Soil Conserv. Div., S. Dak. Agric. College, Brookings
Shulstad, O. H., Pillsbury Mills, Inc., Minneapolis
Sylwester, E. P., Botany and Plant Pathology Dept., Iowa Agric. College, Ames.
Thorfinnson, M. A. Ext. Soil Conservationist, Univ. Farm, St. Paul.